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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/537,863

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Kazutaka Kobayashi

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EXAMINER

ELVE, MARIA ALEXANDRA

ART UNIT

PAPER NUMBER

3742

MAIL DATE

DELIVERY MODE

04/01/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/537,863	Applicant(s) KOBAYASHI, KAZUTAKA	
	Examiner M. Alexandra Elve	Art Unit 3742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 & 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inagawa et al. (USPN 5,166,493) in view of Gaku et al. (USPN 6,280,641) and AAPA (Applicant Admitted Prior Art).

Inagawa et al. discloses a two-step boring process. A first step is a high speed rough boring using a long wavelength laser and second step uses short wavelength laser. Long wavelength lasers may include CO₂ lasers and short wavelengths lasers may include excimer lasers. The long wavelength laser is used to rapidly clean out the via (which generates a black carbide); while the short wavelength laser is used for final cleaning and the generation of carbide black is suppressed. The excimer laser removes the carbide (modified material; a residual from the long wavelength boring). The printed circuit boards are constructed of resin (epoxy), glass and copper foil.

Although Inagawa et al. does not specifically disclose IR and UV lasers, it is known in the art that a short wavelength laser is a UV laser and a long wavelength laser is an IR laser. This is evidenced in reference Bloemeke et al. (USPAP 2004/0112881). In addition Bloemeke et al. discloses that a long

Art Unit: 3742

wavelength laser, IR laser, is a CO₂ laser. Thus Inagawa et al. inherently teaches an IR laser (long wavelength CO₂ laser) and a UV laser (short wavelength excimer laser).

Although Inagawa et al. does not specifically teach an inorganic filler, a glass is taught. It is known in the art that glass in a printed wire board is classified as an inorganic filler; see Kawaguchi et al. (USPAP 2003/0078333). Thus Inagawa et al. inherently teaches an inorganic filler (glass).

Inagawa et al. discloses a resin and glass (filler) printed wire board, but not inorganic fillers such as barium titanate, titanium oxide, strontium titanate and barium-strontium titanate.

Gaku et al. ('641) discloses a printed wire having micro-via holes. A CO₂ laser drills the holes removing resin. The resin of the board is mixed with 10 to 60% inorganic insulating filler. Components of the board may include titanium oxide, rare earth metal oxides and barium sulfate. Other inorganic insulating fillers are silicas (natural silica, calined silica and amorphous silica), white carbon, titanium white, aerogel, clay, talc, wollastonite, natural mica (BaTiO compound), synthetic mica, kaolin, magnesia, alumina and perlite.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use titanium oxide and so forth, as taught by Gaku et al. ('641) in the Inagawa et al. circuit board because are standard components of the boards.

AAPA states that titanium oxide does not absorb within the infrared region and Gaku et al. ('641) discloses titanium oxide. Additionally, AAPA states that UV

Art Unit: 3742

is capable for cleaving C-C bonds in resin and Inagawa et al. discloses resin and the use of UV.

Claims 2 & 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inagawa et al., Gaku et al. ('641) and AAPA, as stated above and further in view of Gaku et al. (USPAP 2003/0049913).

Inagawa et al. teaches a short wavelength laser; an excimer laser, but not a UV-YAG laser.

Gaku et al. ('913) discloses that a UV laser such as an excimer laser and an Nd:YAG laser may be used to form a hole (via) and that UV is a short wavelength. IR is disclosed.

It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the YAG laser as taught by Gaku et al. ('913) for the excimer laser in Inagawa et al. because these are functional equivalents.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Inagawa et al., Gaku et al. ('641) and AAPA, as stated above and further in view of Bui (USPN 6,413,820) or Welsch et al. (USPN 6,22,173).

Gaku et al. ('641) discloses a titanium oxide filler material for circuit boards but does not teach the dielectric constant of the material.

Bui discloses a semiconductor substrate having titanium oxide with a dielectric constant of about 40.

Art Unit: 3742

It would have been obvious to one of ordinary skill in the art at the time of the invention to determined the dielectric constant of the filler material, as taught by Bui in the Inagawa et al. and Gaku et al. ('641) board because this is an important material parameter in the semiconductor industry.

Welsch et al. discloses a titanium oxide dielectric constant of about 165 for the pure oxide.

It would have been obvious to one of ordinary skill in the art at the time of the invention to determine the dielectric constant of the filler material, as taught by Bui in the Inagawa et al. and Welsch et al. board because this is an important material parameter in the semiconductor industry.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Inagawa et al., Gaku et al. ('641) and AAPA, as stated above and further in view of Den et al. (USPN 6,649,824) or Yaita et al. (USPN 6,635,232).

Gaku et al. ('641) discloses a titanium oxide filler material for circuit boards but does not teach the band gap of the material.

Den et al. discloses a photoelectric conversion device. Titanium oxide, a stable semiconductor, has a band gap not less than 3 eV.

It would have been obvious to one of ordinary skill in the art at the time of the invention to determine the band gap, as taught by Den et al. in the Inagawa et al. and Gaku et al. ('641) board because this is an important material property in the semiconductor industry.

Yaita et al. discloses the band gap of titanium oxide of being about 3.2 eV.

Art Unit: 3742

It would have been obvious to one of ordinary skill in the art at the time of the invention to determine the band gap, as taught by Yaita et al. in the Inagawa et al. and Gaku et al. ('641) board because this is an important material property in the semiconductor industry.

Response to Arguments

Applicant's arguments filed 12/1/08 have been fully considered but they are not persuasive.

Applicant argues that Inagawa does not teach “form a via hole with an underlying layer exposed at its bottom”. The examiner respectfully notes that applicant's claim does not state this, but rather the first step forms a via hole and the second step removes the modified layer of resin remaining at the bottom of the hole and form a via hole with an underlying layer exposed at its bottom. Inagawa et al. specifically teaches the first laser forming a via in which a carbide black (modified layer) is formed in the via. The second laser removes the carbide. A third step may be used to remove the underlying layer exposed at its bottom (i.e. step d). Figures 4 & 8 demonstrate the process:

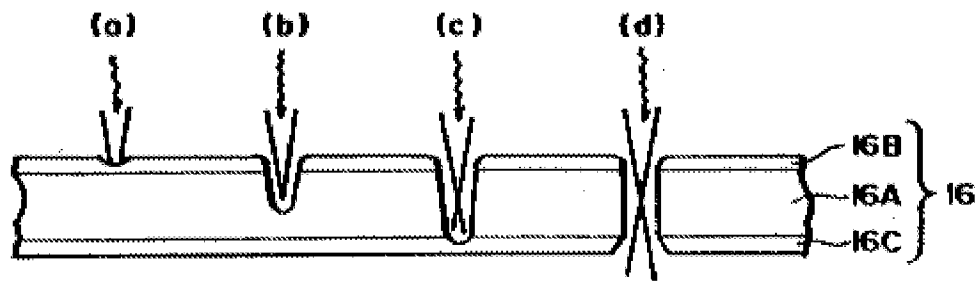


FIG. 4

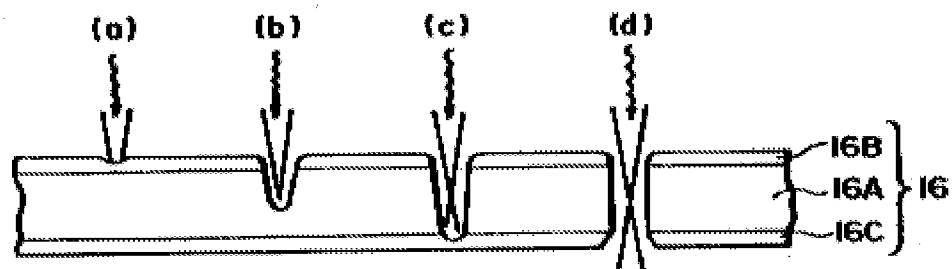


FIG. 8

Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Alexandra Elve whose telephone number is 571-272-1173. The examiner can normally be reached on 7:30-4:00 Monday to Friday.

Art Unit: 3742

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tu B. Hoang can be reached on 571-272-4780. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

March 28, 2009.

/M. Alexandra Elve/
Primary Examiner, Art Unit 3742